

LEARNING OUTCOME

Critical Thinking \approx Problem Solving

QUESTION

- Can you be in two places at once?

Or

- Can you leave Mexico City Hilton at 6 p.m. and arrive the same day at the Royal Hawaiian Hotel in time for a 6 p.m. mai tai on the beach?

If so, then ...

PROBLEM

- Estimate the speed you would have to travel to leave Mexico City Hilton at 6 p.m. to arrive the same day at Royal Hawaiian Hotel at 6 p.m.

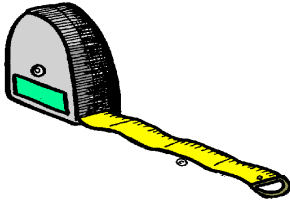


KNOWLEDGE

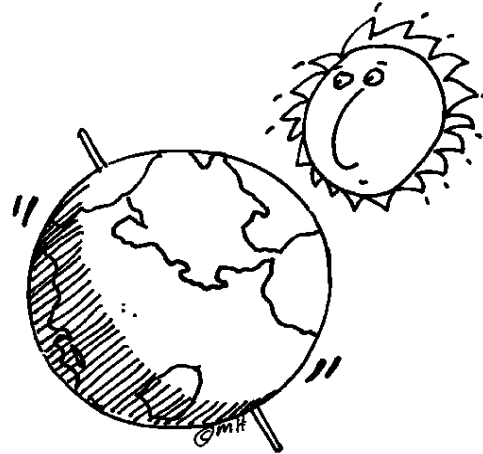
Recall:

- Definitions of measurement and units of measurement.
- The relationship between rate, distance, and time.
- The radius or circumference of the Earth.
- The number of hours in a day.
- Time on the Earth is relative.

KNOWLEDGE



$$\text{rate} = \frac{\text{distance}}{\text{time}}$$



*Radius of
Earth* $\approx 4000_{\text{miles}}$

$$C = 2\pi r^2$$

1 day = 24 hours

COMPREHENSION

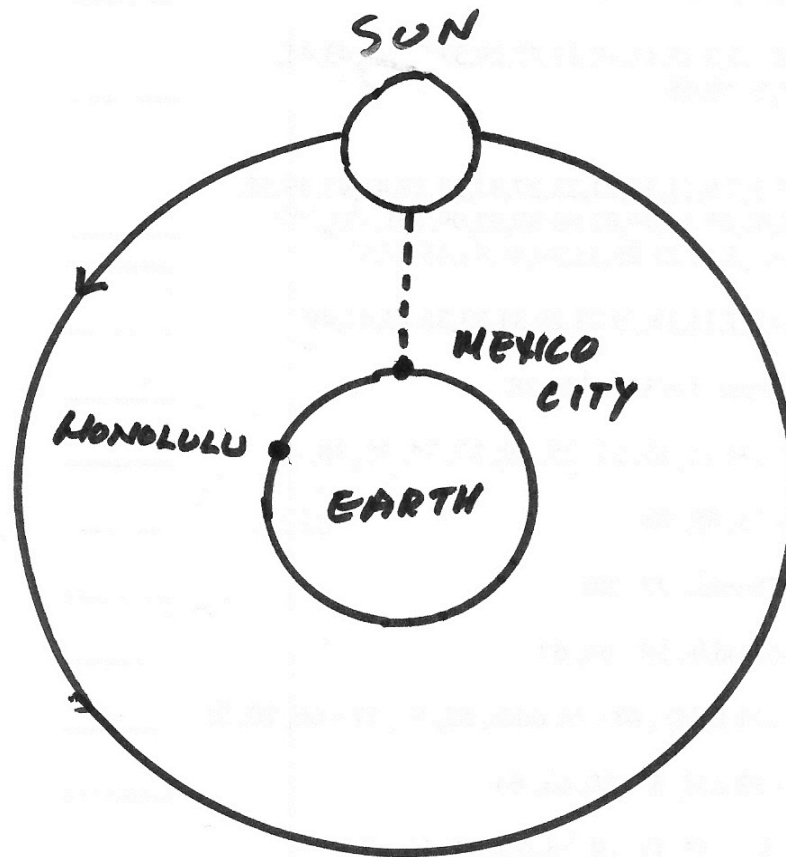
- Recognize that local time depends on the position of the sun and that the perceived motion of the sun is approximately a circle around the Earth.



APPLICATION

- Create a model with a sketch of the relative positions of Mexico City and Honolulu on a circle with the sun directly overhead Mexico City.

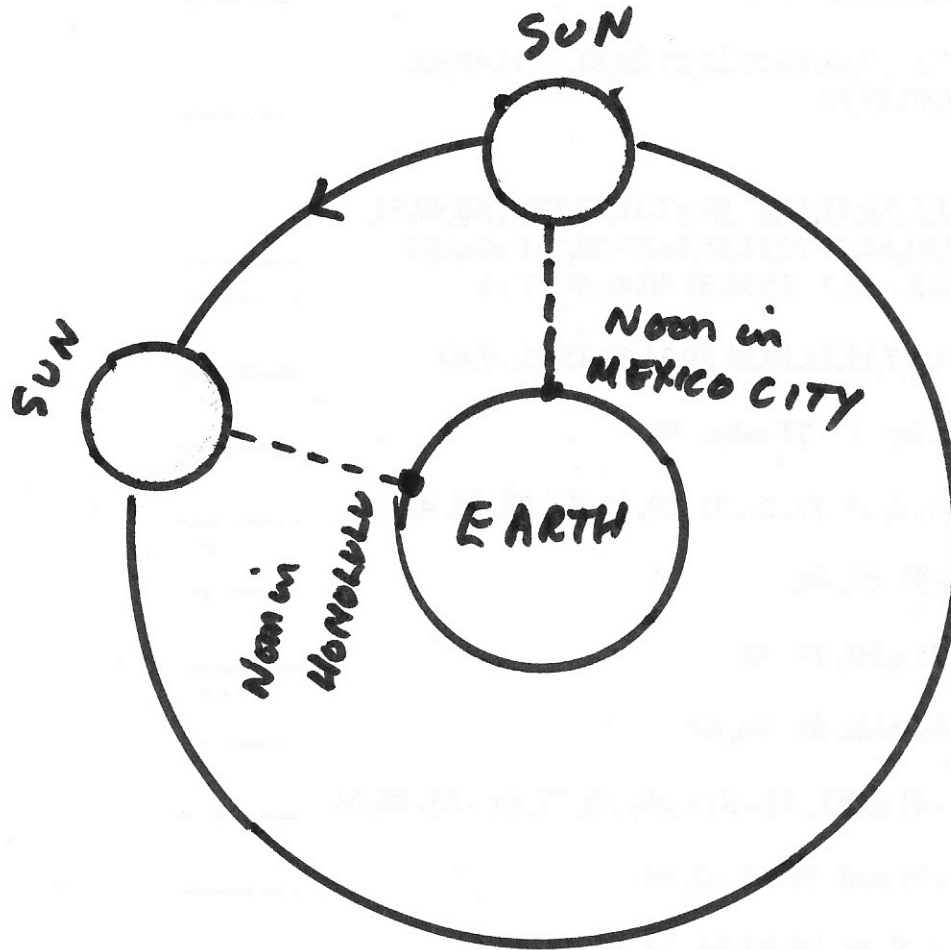
APPLICATION



ANALYSIS

- Conjecture that the time is local noon at Mexico City with the sun directly overhead.
- Experiment by rotating the sun until it is directly overhead Honolulu on the sketch.
- Conclude that your speed = sun's speed (as it moves above you).
- Also, this speed is independent of the time of the day i.e. the time on your watch.

ANALYSIS



SYNTHESIS

- Formulate a solution by computing how fast you would have to swim to stay directly under the sun:
- Your speed = Sun's speed

SYNTHESIS

Calculation:

Sun's speed = One revolution per day

One revolution per day = circumference of the Earth in miles divided by the number of hours in a day.

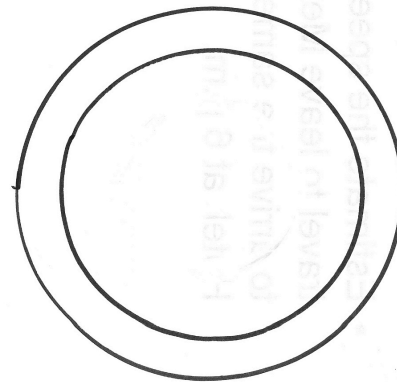
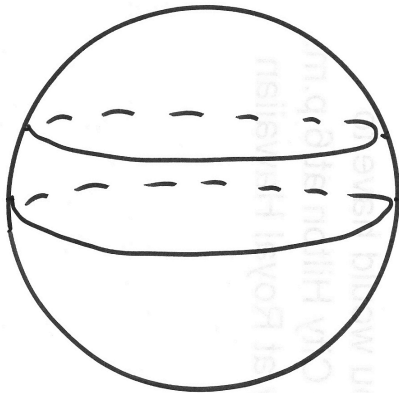
Thus your speed = 25000 miles/24 hrs.
= 1042 m.p.h.

EVALUATION

- Judge the assumptions you made. The speed you computed is based on the circumference of the equator and not on the circle of Latitude (Mexico City and Honolulu are north of the Equator). The circumference of the Latitude circle being the lesser implies that your true speed would be less. So, if you wanted to get to Honolulu at exactly 6 p.m. local time so as to answer the question you wouldn't run/swim as fast as 1042 m.p.h.

EVALUATION

The circumference of the circle of Latitude is less than the circumference of the Equator. Therefore the distance along a N Latitude is less than distance along the Equator.



CONCLUSION

- You can be in two places at the same time. In fact, with an answer of approximately 1042 mph you would get to Honolulu sooner, with time to shop at the International Market Place before your mai tai at 6 p.m.